



Acta Botanica Gallica

Publication details, including instructions for authors and subscription information:

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Current state of the *Prunetalia spinosae* communities in the centre and south of the Iberian Peninsula (Spain, Portugal)

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Version of record first published: 02 Aug 2012

To cite this article: Ana Cano-Ortiz, Carlos Pinto-Gomes, Ricardo Quinto-Canas, Carlos Vila-Viçosa, Alfonso Rodríguez-Torres & M^a Manuela Redondo (2012): Current state of the *Prunetalia spinosae* communities in the centre and south of the Iberian Peninsula (Spain, Portugal), *Acta Botanica Gallica*, 159:2, 211-221

To link to this article: <http://dx.doi.org/10.1080/12538078.2012.696934>

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Société botanique de France

Current state of the *Prunetalia spinosae* communities in the centre and south of the Iberian Peninsula (Spain, Portugal)

L'état actuel des communautés spinosae *Prunetalia* dans le centre et le sud de la péninsule ibérique, Péninsule (Espagne, Portugal)

Ana Cano-Ortiz^{a*}, Carlos Pinto-Gomes^b, Ricardo Quinto-Canas^b, Carlos Vila-Viçosa^b, Alfonso Rodríguez-Torres^c and M^a Manuela Redondo^d

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Abstract: This paper re-examines the *Rhamno-Prunetea* class in the centre and south of the Iberian Peninsula, especially in Andalusia. The paper also deals with the alliances *Pruno-Rubion ulmifolii* *Lonicero-Berberidion hispanicae* in the south of the Iberian Peninsula, and *Berberidion vulgaris* (*Berberidenion seroi*) in the area of Cuenca. Our analysis of 225 relevés arranged in 22 phytosociological tables helped us to re-organize the available information and subsequently propose three associations and two subassociations: *Clematido vitalbae-Rosetum micranthae* nova; *Berberido hispanicae-Buxetum sempervirentis* nova; *Roso siculae-Berberidetum hispanicae* Mota nova subas. *prunetosum ramburii* Mota nova; *Lonicero arboreae-Rhamnetum cathartici* Martínez-Parras and Molero 1983 subas. *prunetosum ramburii* nova. As a result of the study, a total of 18 syntaxa with the rank of association and four with the rank of subassociation are proposed for the south of the Iberian Peninsula.

Keywords: Andalusia; association; bramble patches; thorny thicket.

Résumé: Nous révisons la classe *Rhamno-Prunetea* dans le centre-sud de la Péninsule Ibérique en nous occupant surtout de l'Andalousie. Nous étudions les alliances de *Pruno-Rubion ulmifolii*, *Lonicero-Berberidion hispanicae* du sud ibérique et de *Berberidion vulgaris* (*Berberidenion seroi*) dans les territoires de Cuenca. L'analyse de 225 inventaires présentes dans les 22 tables phytosociologiques nous permet de réorganiser l'information et de proposer trois associations et deux subassociations: *Clematido vitalbae-Rosetum micranthae* nova; *Berberido hispanicae-Buxetum sempervirentis* nova; *Roso siculae-Berberidetum hispanicae* Mota nova subas. *prunetosum ramburii* Mota nova; *Lonicero arboreae-Rhamnetum cathartici* Martínez-Parras et Molero 1983 subas. *prunetosum ramburii* nova. Comme conséquence de ces études nous fournissons pour le sud ibérique 18 syntaxons avec le rang d'association et 4 avec celui de subassociation.

Mots clés: Andalousie; association; Épinaie; ronceraie

Introduction

The territory under study is located in the centre and south of Spain and Portugal. The paper provides a general analysis of the *Rhamno-Prunetea* class, which is widely distributed throughout the territory, particularly in the mountainous areas. The class is not as frequent in the warmer zones of Andalusia, where it is usually found in the form of bramble patches of *Lonicero hispanicae-Rubetum ulmifolii*. Whereas the bramble patch communities have been included in the *Pruno-Rubion ulmifolii* (subal. *Rosenion carioti-pouzinii*) alliance, the thorny thickets have been included in the *Lonicero-Berberidion hispanicae* alliance. All of these bramble patch and thorny thicket communities have already been studied by

authors such as Asensi, Rivas-Martínez, G. López, Molero, Ríos, Valle, Peinado, Gómez-Mercado, etc., but there have been few general approaches to the vegetation of the south of the Iberian Peninsula, where the description of syntaxa is still a matter of contention. A general survey of the class is, consequently, badly needed, at least for the south of the Iberian Peninsula.

Material and methods

This paper analyses 16 associations of bramble patch, thorny thicket and box tree scrub, 14 of them in the south of the Iberian Peninsula in combination with *Ligustro vulgaris-Berberidetum seroi* and *Berberido-buxetum semper-*

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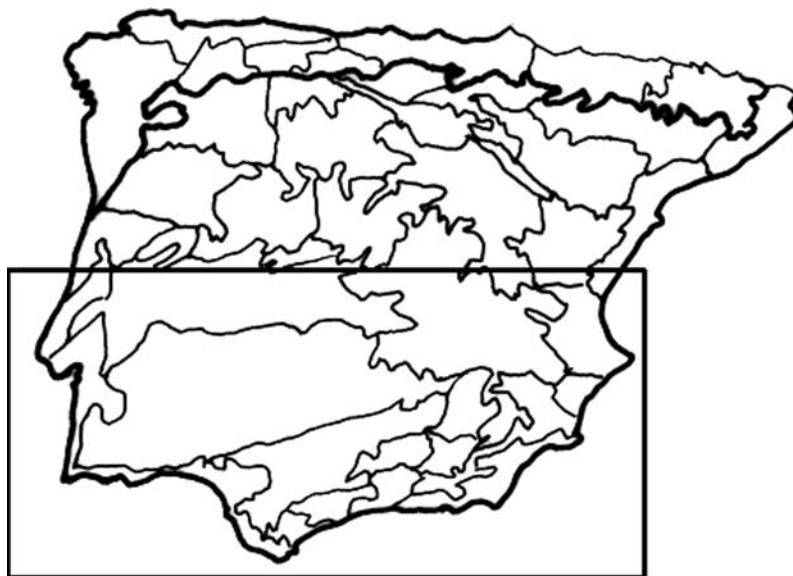


Figure 1. Location of the study area.

Figure 1. Emplacement de la surface étudiée.

virentis in the area of Cuenca. A total of 362 species (rows) by 225 relevés (columns) are compared to obtain a general cluster with the different groups. Particular attention is paid to the Andalusian box tree scrubs of the Parque Natural de Cazorla, Segura, Las Villas and Sierra Pandera. The source material used has been taken either from our own relevés or from the published relevés of other authors (López 1976; Arnaiz 1979; Asensi and Rivas-Martínez 1979; Rivas-Martínez et al. 1980, 2002; Martínez-Parras and Molero Mesa 1982, 1983; Peinado, Moreno and Velasco 1983; Martínez-Parras, Peinado and Alcaraz 1987; Valle Gómez Mercado and Mota 1988; Gómez Mercado and Valle 1988; Mota Poveda 1990; Alcaraz et al. 1991; Torres Cordero 1997; Inocencio, Alcaraz and Ríos 1998; Ríos Ruiz, Alcaraz and Valdés 2003) (Figure 1).

The study area essentially corresponds to Andalusia (Spain) and the south of Portugal. However, for comparative purposes, other studies describing associations in the centre of the Iberian Peninsula are also used in our analysis. The various habitats of *Rhamno-Prunetea* tend to be located in environments ranging from the thermomediterranean to oromediterranean belts, always on either siliceous or basic soils. Except for some habitats found in gullies, all the other habitats are located in sites with a subhumid-humid ombroclimate. For our biogeographical analysis we have followed Rivas-Martínez (2007).

Results and discussion

Statistical analysis

The cluster generated for the 16 habitats reveals that some groups are clearly separated from each other, whereas others are less so. Some of the more clearly defined habitats in our cluster analysis are: *Rubo ulmifolii-Rosetum corymbiferae*, *Rosetum micrantho-agrestis*, *Rubetum caesio-*

canescentis, *Lonicero arborece-Rhamnetum cathartici* etc. Meanwhile, many of the relevés recorded as *Crataego monogynae-Loniceretum arborece*, *Lonicero splendidae-Buxetum sempervirentis*, *Cleamtido campaniflorae-Rubetum ulmifolii*, *Rubo ulmifolii-Corietum myrtifoliae* and even some of *Rosetum micrantho-agrestis*, appear to belong to different groups. As far as the relevés with box trees are concerned, they form a large group, with different subgroups. In this respect, the relevés with box trees in Andalusia appear separated from those of Cuenca. Nevertheless, in the cluster, relevés 202, 203, 204 and 205 in table 16 by López (1976) appear close to the Andalusian relevés with box trees. This is because those relevés do not include *Berberis vulgaris* subsp. *seroi*, a differential taxon of *Berberido-Buxetum sempervirentis* Rivas-Martínez and G. López in López (1976).

A closer look at the cluster reveals nine groups (G_1 to G_9), with some that are particularly well defined. Group G_1 , which is very homogeneous, corresponds to *Rubo-Rosetum corymbiferae* (rel. 1–21). By contrast, group G_2 is heterogeneous (rel. 81–209) and comprises two subgroups. Cluster relevés 81–180 belong to G_{21} . Here we find a first package P_1 (81–176) made up of five relevés: on the one hand, 81, 82, 85 and 86, from table 3 as published by Peinado, Moreno and Velasco (1983), such as *Cleamtido campaniflorae-Rubetum ulmifolii*; on the other, relevé 185, taken in Molina de Don Benito, Alcalá del Júcar (Albacete), which also appears in P_1 and was included by Ríos Ruiz, Alcaraz and Valdés (2003) in *Rosetum micrantho-agrestis* on account of its fragmentary character, given that it has none of the characteristic species of the association, namely, *Rosa micrantha*, *Rosa agrestis*. Considerably closer to these five relevés there are some samples (207–215) from the original table (62, rel. 1–9) by Rivas-Martínez et al. (1980), which belong to *Lonicero hispanicae-Rubetum*

ulmifolii. Samples 173–176 from table 57 (rel. 7–10), as published by Ríos Ruiz, Alcaraz and Valdés (2003), are also included in this package P₁. Relevés (81–176) should all really be ascribed to *Lonicera ulmifolii-Rubetum ulmifolii*. The second package, P₂, of subgroup G₂₁ comprises the cluster relevés 156–180, which have been included in the associations *Rubo ulmifolii-Coriarietum myrtifoliae* subas. *nerietosum oleandri* of table 55 (rel. 1–6) as provided by Ríos Ruiz, Alcaraz and Valdés (2003). Samples 188 to 180 correspond to relevés from

table 56 of Ríos Ruiz, Alcaraz and Valdés (2003), such as *Rosetum micrantho-agrestis*. These relevés do not belong to this association. On the contrary: they represent a cold variant within *Rubo ulmifolii-Coriarietum myrtifoliae*, which acts as a transition formation with the mesomediterranean and supramediterranean *Rosetum micrantho-agrestis* community from La Mancha. Finally, subgroup G₂₂ comprises samples 83 and 84 of table 3 (rel. 3–4), as published by Peinado, Moreno and Velasco (1983). These belong to *Clematido campaniflorae-Rube-*

Table 1. *As. Berberido hispanicae-Buxetum sempervirentis*.
Tableau 1. *As. Berberido hispanicae-Buxetum sempervirentis*.

| | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Altitude in m l=10 | 130 | 110 | 100 | 120 | 110 | 140 | 138 | 132 | 130 | 162 | 135 | 120 |
| Surface in m ² | 200 | 200 | 400 | 400 | 200 | 200 | 300 | 200 | 150 | 180 | 200 | 200 |
| Cover rate% | 70 | 80 | 60 | 70 | 60 | 90 | 90 | 90 | 70 | 75 | 60 | 80 |
| Average height of veg. (m.) | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1.5 | 1.5 | 1.5 | 0.9 | 1.5 |
| Slope% | 5 | 10 | 10 | 10 | 5 | - | 25 | 25 | 20 | 25 | 25 | 10 |
| Orientation | NW | NW | N | S | S | - | N | N | N | N | N | NW |
| Relevé no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Characteristic ass. of upper units | | | | | | | | | | | | |
| <i>Buxus sempervirens</i> | 3 | 4 | 3 | 3 | 3 | 5 | 5 | 5 | 3 | 4 | 3 | 4 |
| <i>Berberis hispanica</i> | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 1 |
| <i>Amelanchier ovalis</i> | 1 | . | . | 1 | 2 | 1 | 1 | . | 1 | 2 | . | + |
| <i>Crataegus monogyna</i> | 3 | 2 | + | 1 | + | . | + | + | 2 | 2 | + | . |
| <i>Helleborus foetidus</i> | + | 1 | + | + | + | . | . | 1 | . | + | . | + |
| <i>Rhamnus saxatilis</i> | + | + | . | . | . | + | . | . | . | + | . | . |
| <i>Lonicera arborea</i> | 1 | . | + | . | + | . | . | 1 | . | . | . | 1 |
| <i>Daphne laureola subsp. latifolia</i> | . | . | . | + | . | . | + | . | + | + | 3 | . |
| <i>Rosa sicula</i> | . | . | . | . | 1 | 1 | . | . | . | + | . | . |
| <i>Prunus spinosa</i> | . | . | . | + | 1 | . | . | . | + | . | . | . |
| <i>Rosa micrantha</i> | . | . | . | 2 | . | . | . | . | + | . | . | . |
| <i>Prunus prostrata</i> | . | . | . | 2 | . | . | . | . | . | 1 | . | . |
| <i>Prunus mahaleb</i> | . | . | . | . | . | . | 1 | . | . | . | . | . |
| <i>Lonicera splendida</i> | 1 | . | . | . | . | . | . | . | . | . | . | . |
| Companions | | | | | | | | | | | | |
| <i>Acer monspessulanum</i> | 2 | 2 | + | 1 | 1 | + | 1 | 2 | . | . | . | . |
| <i>Quercus rotundifolia</i> | 1 | 2 | 2 | . | 2 | . | . | 1 | 1 | . | . | + |
| <i>Conopodium ramosum</i> | + | . | . | . | . | . | + | . | . | . | . | . |
| <i>Cytisus reverchonii</i> | + | . | . | . | 1 | . | . | 1 | . | . | . | . |
| <i>Ulex parviflorus</i> | . | 2 | + | . | . | . | . | . | 1 | . | . | . |
| <i>Bupleurum spinosum</i> | . | 1 | . | + | . | . | + | . | . | . | . | . |
| <i>Erinacea anthyllis</i> | . | . | . | 1 | 1 | . | . | . | . | + | . | . |
| <i>Ononis aragonensis</i> | . | . | . | . | 1 | 1 | 1 | . | . | 1 | . | . |
| <i>Brahcypodium sylvaticum</i> | + | . | . | . | + | . | . | + | . | . | . | . |
| <i>Quercus alpestris</i> | 2 | . | . | . | . | + | . | . | . | . | + | 1 |
| <i>Pistacia terebinthus</i> | . | . | + | . | . | . | . | . | . | . | . | + |
| <i>Echinopartium boissieri</i> | . | . | . | . | + | . | . | 1 | 1 | . | . | 1 |
| <i>Sorbus aria</i> | . | . | . | 2 | . | 1 | 1 | . | . | . | . | . |
| <i>Paeonia broteroi</i> | . | . | . | . | . | . | . | 1 | . | . | . | . |
| <i>Hormatophylla spinosa</i> | . | . | . | . | . | + | . | . | . | 1 | . | . |
| <i>Genista cinerea subsp. speciosa</i> | + | . | . | . | . | . | . | 1 | . | . | . | . |
| <i>Thymus mastichina</i> | . | + | . | . | + | . | . | . | . | + | . | + |
| <i>Thymus orospedanus</i> | . | . | . | . | + | . | + | . | . | . | . | . |
| <i>Thymus gracilis</i> | 1 | . | . | . | . | . | + | . | . | . | . | + |
| <i>Festuca scariosa</i> | . | . | . | . | . | . | . | . | . | 1 | . | . |
| <i>Brachypodium retusum</i> | + | . | . | . | . | . | . | . | + | . | . | . |
| <i>Rhamnus myrtifolius</i> | . | . | . | . | . | . | . | 1 | . | + | 1 | . |
| <i>Juniperus phoenicea</i> | . | . | . | . | . | . | . | . | . | . | 1 | 1 |
| <i>Aphyllantes monspeliensis</i> | . | . | . | . | . | . | . | . | . | . | + | . |
| <i>Antirrhinum graniticum subsp. boissieri</i> | . | . | . | . | . | . | + | . | . | . | . | . |
| <i>Acinos alpinus subsp. meridionalis</i> | . | . | . | . | . | . | 1 | . | . | . | . | . |

Sites: 1, 2. Cerro Quemado (Campillo Arenas). 3. La Cornicabra (Carchelejo). 4, 7. Altar (Los Villares). 5, 6, 8, 9, 10. Sierra de Pandera. 11, 12. Sierra de las Cuatro Villas.

Emplacements: 1, 2. Cerro Quemado (Campillo Arenas). 3. La Cornicabra (Carchelejo). 4, 7. Altar (Los Villares). 5, 6, 8, 9, 10. Sierra de Pandera. 11, 12. Sierra de las Cuatro Villas.

Table 2. Synthetic analysis of the tables under study.
Tableau 2. Analyse synthétique des tables étudiées.

| Association no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|----|----|---|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|----|-----|-----|-----|----|----|-----|
| <i>Rosa canina</i> | V | IV | . | III | . | III | III | V | III | IV | III | I | III | III | I | I | III | II | III | II | I | . |
| <i>Crataegus monogyna</i> | IV | V | 2 | IV | . | IV | . | V | V | V | . | . | II | V | V | I | V | I | V | IV | I | III |
| <i>Rubus ulmifolius</i> | V | IV | . | V | . | V | . | II | . | II | II | . | V | II | I | V | V | V | . | . | V | . |
| <i>Rosa pouzini</i> | V | IV | . | . | . | . | I | IV | IV | III | III | . | II | V | I | . | . | . | I | I | . | . |
| <i>Loniceria periclymenum subsp.hispanica</i> | II | I | . | I | V | III | V | IV | III | V | V | V | . | . | . | I | III | II | V | I | V | V |
| <i>Berberis hispanica</i> | . | . | 2 | I | . | . | V | V | V | V | V | V | I | V | . | . | II | . | . | . | . | . |
| <i>Rosa corymbifera</i> | V | . | . | II | . | . | . | . | . | . | . | . | . | . | III | . | II | . | . | . | . | . |
| <i>Rosa micrantha</i> | V | V | 2 | I | . | . | . | . | . | IV | II | . | . | . | I | I | II | IV | II | . | . | I |
| <i>Prunus spinosa</i> | IV | II | . | . | . | . | . | II | . | . | II | . | . | I | III | . | I | . | . | . | . | I |
| <i>Loniceria etrusca</i> | II | . | + | . | . | . | . | . | . | . | III | . | IV | III | I | II | I | . | I | I | . | . |
| <i>Tamus communis</i> | I | I | . | . | . | III | . | . | . | . | I | . | . | . | . | . | III | . | . | . | I | . |
| <i>Clematis vitalba</i> | . | . | . | I | . | . | . | . | . | III | . | . | III | . | . | IV | III | III | I | . | . | . |
| <i>Rhamnus saxatilis</i> | . | . | + | . | II | . | . | . | . | . | V | II | . | . | V | . | . | I | I | II | . | II |
| <i>Loniceria arborea</i> | . | . | . | . | II | . | V | . | II | I | II | II | . | V | . | . | . | . | IV | I | . | II |
| <i>Amelanchier ovalis</i> | . | . | . | . | II | . | . | . | . | . | . | . | . | . | III | . | . | . | I | II | . | III |
| <i>Rosa cariotii</i> | IV | IV | . | . | . | . | . | . | II | I | II | II | II | . | . | . | . | . | . | . | . | . |
| <i>Rosa andegavensis</i> | II | I | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Bryonia dioica</i> | I | I | . | . | . | . | I | . | . | . | . | . | . | . | . | . | . | I | . | . | . | . |
| <i>Rosa tomentosa</i> | II | I | . | . | . | . | . | . | . | . | . | . | . | II | . | . | . | . | . | . | . | . |
| <i>Rhamnus cathartica</i> | I | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rosa tomentosa subsp. scabriuscula</i> | I | . | . | . | . | . | . | . | . | . | . | . | . | II | . | . | . | . | . | . | . | . |
| <i>Rosa agrestis</i> | . | V | . | . | . | . | . | . | . | II | . | . | I | . | . | I | . | II | . | . | . | . |
| <i>Ligustrum vulgare</i> | . | I | . | . | . | . | . | . | . | . | . | . | I | I | V | I | . | . | . | . | . | . |
| <i>Cornus sanguinea</i> | . | I | . | . | . | . | . | . | . | . | . | . | . | . | III | . | . | . | . | . | . | . |
| <i>Rosa nitidula</i> | . | I | . | V | . | . | . | . | . | . | . | . | . | . | . | I | I | I | . | . | . | . |
| <i>Rhus coriaria</i> | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Arum orientale subsp.lucanum</i> | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Crataegus laciniata</i> | . | . | 4 | III | . | . | . | . | III | . | . | . | . | . | . | . | I | . | . | . | . | I |
| <i>Prunus prostrata</i> | . | . | + | . | II | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rubus canescens</i> | . | . | . | V | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rubus sect.Corylifolii</i> | . | . | . | IV | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Prunus insititia</i> | . | . | . | III | . | . | . | . | . | . | . | . | . | . | . | . | I | . | . | . | . | . |
| <i>R. ulmifolius x R.canescens</i> | . | . | . | III | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Viburnum lantana</i> | . | . | . | II | . | . | . | . | . | V | . | . | . | I | V | I | . | III | . | . | . | . |
| <i>Rubus caesius</i> | . | . | . | I | V | . | . | . | . | . | . | . | . | . | . | . | . | . | I | . | . | I |
| <i>Rosa sicula</i> | . | . | . | . | III | V | . | . | II | . | . | V | . | . | . | . | . | . | I | II | . | . |
| <i>Prunus ramburii</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Clematis campaniflora</i> | . | . | . | . | . | . | V | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rhamnus catharticus</i> | . | . | . | . | . | . | V | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Crataegus monogyna subsp.brevispina</i> | . | . | . | . | III | . | V | IV | . | . | V | V | . | . | . | . | . | . | I | . | . | I |
| <i>Prunus mahaleb</i> | . | . | . | . | . | . | . | III | II | . | . | . | . | I | . | . | . | . | . | . | . | . |
| <i>Rosa spinosissima</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Loniceria implexa</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | I | . | . | . | . |

[illegible]

tum ulmifolii, which includes the type relevé, whereas relevé 209 is included in group G₂ because of its fragmentary character.

G₃ is made up of relevés 160–183. These have been interpreted as belonging to *Rubus ulmifolii*-*Coriaria myrtifoliae*, *Rosetum micrantho-agrestis* and *Rubus-Rosetum corymbiferae*. This latter has already been described for the mesomediterranean and supramediterranean Castilian-Leonese plateau. According to its ecological and floristic profile, Group G₃ does not correspond to the associations in which the relevés have been included. Consequently, we propose the new *Clematido vitalbae*-*Rubetum ulmifolii* association. Group G₄ (rel. 68–73) is clearly defined and corresponds to *Rubetum caesiocanescens*. G₅ (rel. 162–166) corresponds to a section of table 55, rel. 7–11, as published by Ríos Ruiz, Alcaraz and Valdés (2003), described for lower, Iberian-Levantine, thermomediterranean and mesomediterranean areas and included in *Rubus ulmifolii*-*Coriaria myrtifoliae*.

Cluster relevés of group G₆ (rel. 139–145) belong to *Lonicero splendidae*-*Buxetum sempervirentis*, an association described in Cazorla by Gómez Mercado and Valle (1988) (table 3, rel. 1–9).

The association described by Arnaiz (1979) (Table 2, rel. 1–31) as *Rosetum micrantho-agrestis* for the meso- and supramediterranean Celtiberian-Alcarrean and Manchegan Sectors comprises rels. 36–62 of group G₇ in the cluster.

G₈ is a complex group with five subgroups (G₈₁–G₈₅) made up of rels. 67–206. Relevé 67, the original and only one of *Berberido hispanicae*-*Crataegutum laciniaetae* in existence, was made in the Cortijo del Pocico, Siles (Jaén). The association was described by Alcaraz *et al.* (1991) for Alcaracensean and Manchegan-Espunensean territories. The sample constitutes group G₈₁ with 153, 154, 155, which belong to the association *Ligustro vulgaris*-*Berberidetum seroi*, described by López (1976) for the site of Tragacete (mountain ranges of Cuenca). Subgroup G₈₂ (rels. 74–137) is made up of three kinds of relevés: 74 to 80 belong to *Roso siculae*-*Berberidetum hispanicae berberidetosum hispanicae* and *prunetosum ramburii*, described by Mota Poveda (1990) for the oromediterranean belt of the Betic province; 127 to 137 belong to *Cotoneastro granatensis*-*Prunetum ramburii*, described by Martínez Parras and Molero Mesa (1983) for the eastern section of the Betic province; finally, relevés 198, 199, 200 made by Martínez-Parras, Peinado and Alcaraz (1987) for the oromediterranean belt of Sierra de Baza and ascribed to the association *Crataego-Loniceretum arborece* are also included in this small subgroup. All the relevés of subgroup G₈₂ (127–137) must be ascribed to *Cotoneastro granatensis*-*Prunetum ramburii*, described by Martínez-Parras and Molero Mesa (1983). Samples 87, 88, 89, ascribed to *Lonicero arboreae*-*Rhamnetum cathartici* by Martínez Parras and Molero Mesa (1982), belong to subgroup G₈₃. The box tree scrubs growing in the Subbetic sector and those recorded by López (1976) in the mountain ranges of

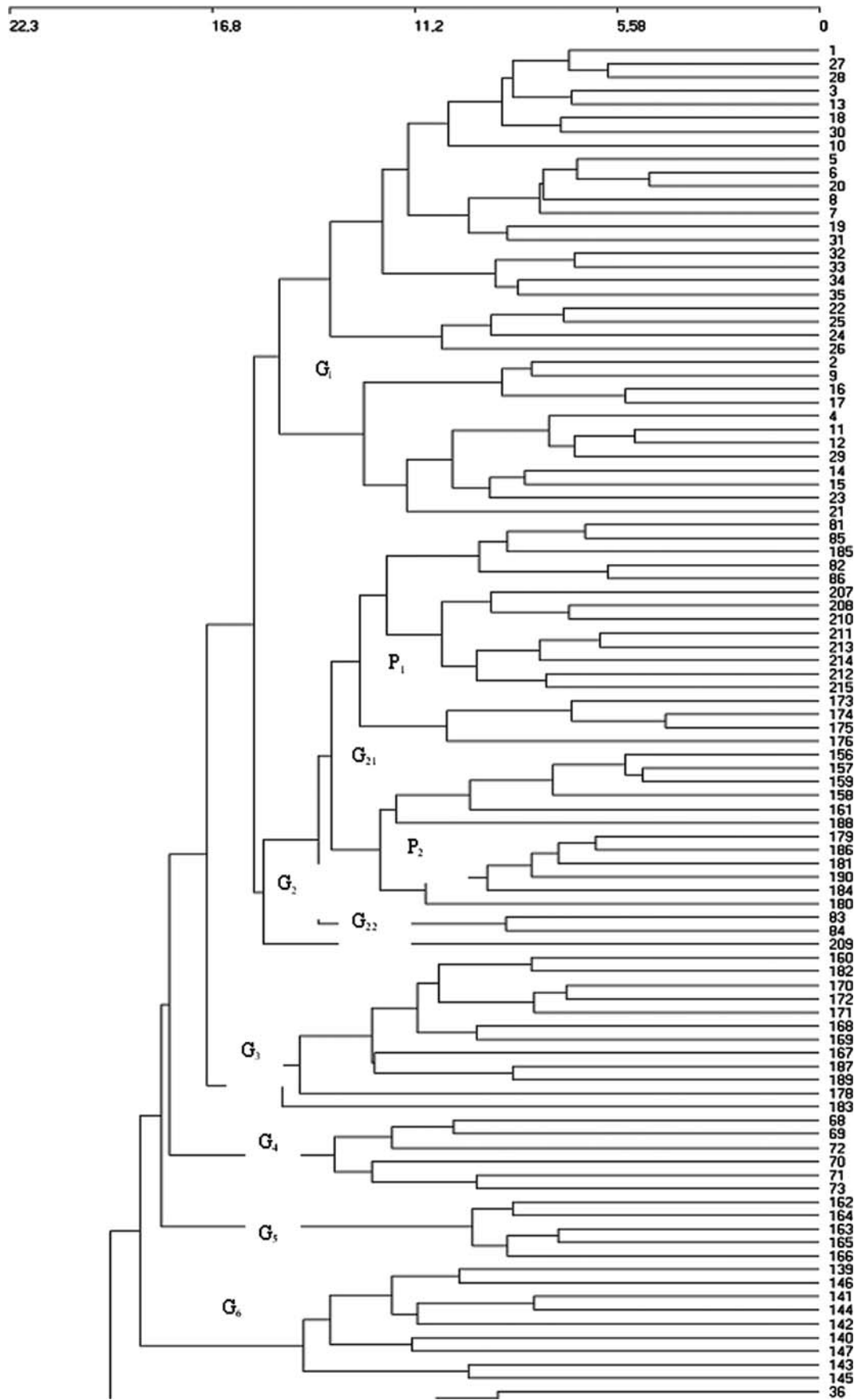


Figure 2. Statistical analysis (cluster).

Figure 2. Analyse statistique (cluster).

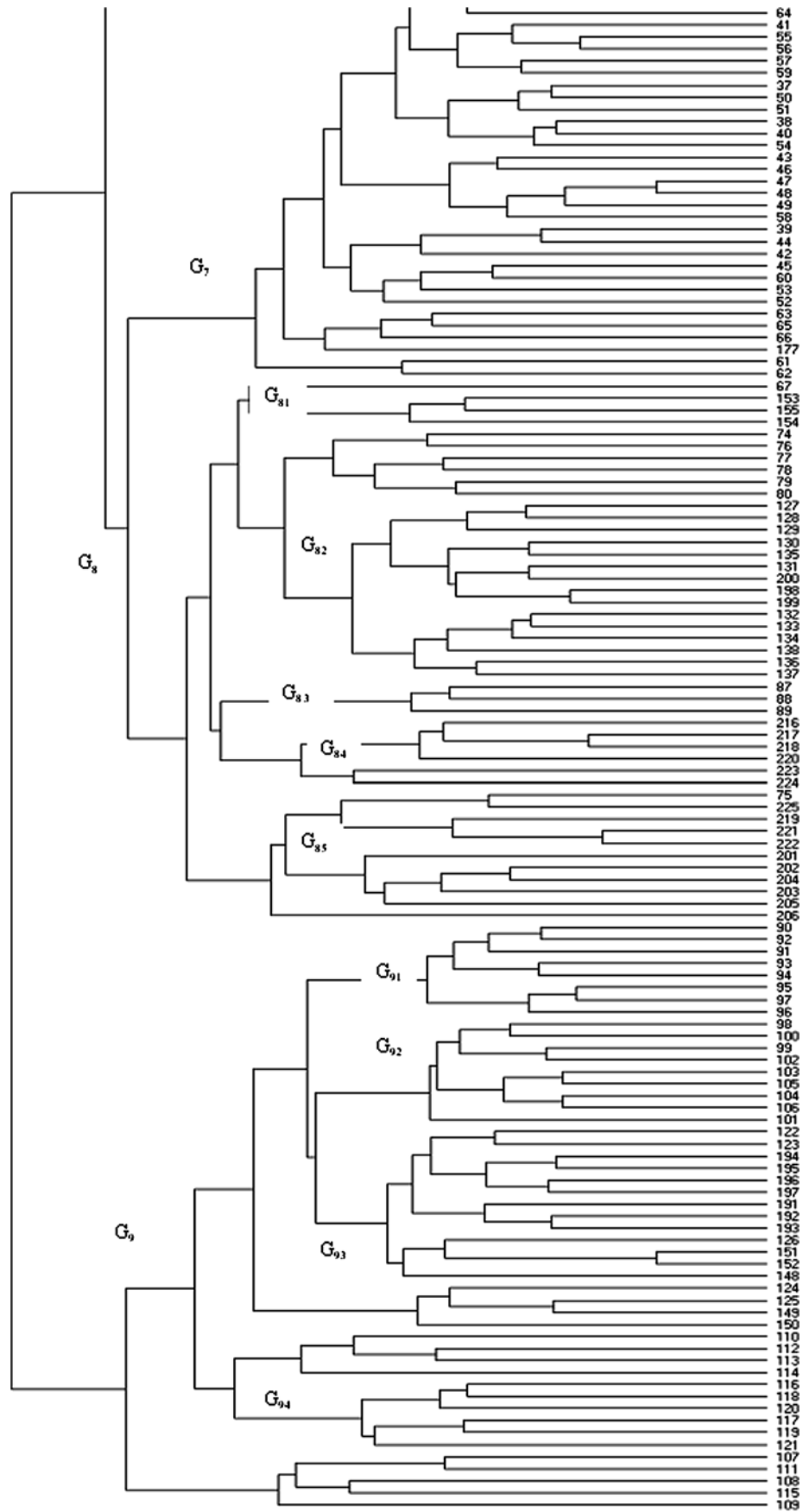


Figure 2. (Continued).

Cuenca as *Berberido seroi-Buxetum semperivirentis* belong to subgroups G₈₄ and G₈₅. Due to the absence of *Berberis seroi* in the Subbetic sector, these box tree scrubs can be clearly divided into two subgroups.

Finally, Group G₉ comprises four subgroups (G₉₁–G₉₄), which represent different associations. Subgroup G₉₁ (rel. 90–96) clearly belongs to the association *Pruno mahalebo-Berberidetum hispanicae*. G₉₂ is made up of a group of relevés (98–101), all belonging to *Lonicero splendidae-Berberidetum hispanicae*. Relevés 122 to 150, that is subgroup G₉₃, belong to *Crataego monogynae-Loniceretum arborece*. All the relevés of this group were made in the province of Jaén and near the city of Granada. They belong to the Subbetic and Granadine-Almijarensian Sectors. Subgroup G₉₃ is very close to G₉₂ because a large number of relevés were made in the Sierra de Alfacar (Granada), which is on the boundary line between the Subbetic Sector and the Granadine-Almijarensian Sector. Subgroup G₉₄ includes relevés 110–121, all made in the Cazorlensean unit and belonging to the association *Viburno lanatanae-Berberidetum australis*, described by Valle, Gómez Mercado and Mota (1988) (Table 3, rels. 1–15). In this case, the relevés of the type association are separate from those of the subsociation *rubetosum canescentis*, also described by the same authors (Figure 2).

Phytosociological analysis

The study of the order *Prunetalia spinosae* Tüxen 1952 (*Rhamno-Prunetea spinosae* Rivas Goday and Borja ex Tüxen 1962) deals with 16 associations of bramble patch, thorny thicket and *Buxus sempervirens* communities growing in the centre and south of the Iberian Peninsula. Of the 14 associations recorded by different authors in Andalusia, 12 occur in the biogeographical sectors of the Betic province and only two in the Marianic-Monchiquensean Sector (Lusitan-Extremadurean Subprovince). These habitats are included in Annexe 1 of the Directive 92/43/EEC under the code number 5110. The best represented habitats are the bramble patches of *Lonicero hispanicae-Rubetum ulmifoliae* Rivas-Martínez, Costa, Castroviejo and E. Valdés 1980, *Lonicero splendidae-Berberidetum hispanicae* Asensi and Rivas-Martínez 1979 and *Crataego monogynae-Loniceretum arborece* O. Bolòs 1954. On the other hand, the least represented habitats in Andalusia are those of *Berberido hispanicae-Crataegetum laciniatae* Ríos and Alcaraz in Alcaraz, P. Sánchez, De la Torre, Ríos and J. Álvarez 1991, (an association very close to *Ligustro vulgaris-Berberidetum seroi*, from which it differs in the presence of *Berberis hispanica*), *Rubetum caesio-canescentis* Rivas-Martínez, T. E. Díaz, Fernández-González, Izco, Loidi, Lousa and Penas 2002, *Clematido campaniflorae-Rubetum ulmifolii* Peinado and Velasco in Peinado, G. Moreno and A. Velasco 1983 and the box tree scrub of *Buxus sempervirens*, which has been included in the association *Berberido-Buxetum sempervirentis* Rivas-Martínez and G. López in López (1976), described for the mountain ranges of

Cuenca (López 1976), but from which it differs because of the absence of *Rhamnus alpina* (despite the fact that this species spreads as far as the northeastern Betic zones of Andalusia) (Blanca et al. 2009) and *Berberis vulgaris* subsp. *seroi*, which in the Betic territories is replaced by *Berberis hispanica*.

Whereas *Berberido-Buxetum sempervirentis* Rivas-Martínez and G. López in López (1976) represents the rim of the gall-oak grove of *Cephalanthero rubrae-Quercetum fagineae* Rivas-Martínez in Rivas Goday et al. 1960 corr. Rivas-Martínez 1972, the new box tree community proposed as *Berberido hispanicae-Buxetum sempervirentis* nova (Table 1, rels. 1–12, typus rel.10), represents the rim of forests of *Daphno latifoliae-Aceretum granatensis* Rivas-Martínez 1965 and the gall-oak grove of *Berberido hispanicae-Quercetum alpestris* Rivas-Martínez 2010. The box tree scrubs described by López (1976) for the mountain ranges of Cuenca are characterized by the presence of *Berberis vulgaris* subsp. *seroi*. However, this taxon is absent in the relevés 2, 4 and 6 of table 16 (rel. 1–6), as published by this author. For this reason, groups G₄ and G₅ are very close in the cluster. Nevertheless, there are enough floristic, biogeographical and dynamic differences to support *Berberido-Buxetum sempervirentis* and the new syntaxon proposed (Figure 3).

The cluster analysis (Figure 2) reveals a group, G₃, relevés (160–183), which Ríos Ruiz, Alcaraz and Valdés (2003) included in the associations *Rubo ulmifolii-Corietum myrtifoliae*, *Rosetum micrantho-agrestis*, *Rubo ulmifolii-Rosetum corymbiferae*, (table 55, rel. 5; table 56, rel. 2, 6, 7, 11 and 13; table 57, rel. 1–6). However, an inspection of these tables clearly reveals that these relevés do not belong to the associations to which they were previously ascribed on account of the ecological, floristic and dynamic differences involved. Consequently, we propose the association *Clematido vitalbae-Rosetum micranthae* nova, which is dominated by *Rubus ulmifolius*, *Clematis vitalba* and *Rosa micrantha*. This new association differs from *Rosetum micrantho-agrestis* because of the presence of *Clematis vitalba* and the absence of *Rosa agrestis*, and in mesomediterranean environments it constitutes the vegetal rim of *Rubio tinctorum-Populetum albae* (in the Manchegan Sector). As the typus relevé we have opted for relevé 6 of table 56 as published by Ríos Ruiz, Alcaraz and Valdés (2003).

In subgroup G₈₂ there are two packages of relevés P₁ (74–80) described by Mota Poveda (1990) as *Roso siculae-Berberidetum siculae* subas. *prunetosum ramburii* but still not validly published (CPN, art. 1 and 2). The presence of *Rosa sicula* and the absence of *Rosa myriacantha* del *Rosetum myriacantho-siculae* make it different from *Lonicero splendidae-Berberidetum hispanicae*. This association, described for the oromediterranean belt of the Betic province, represents the rim of calcicolous Betic pine and savine forests, a distinctive feature when compared with the rest of the thorny thickets described for the mesomediterranean and supramediterranean belts. Consequently, we support the association *Roso siculae-*

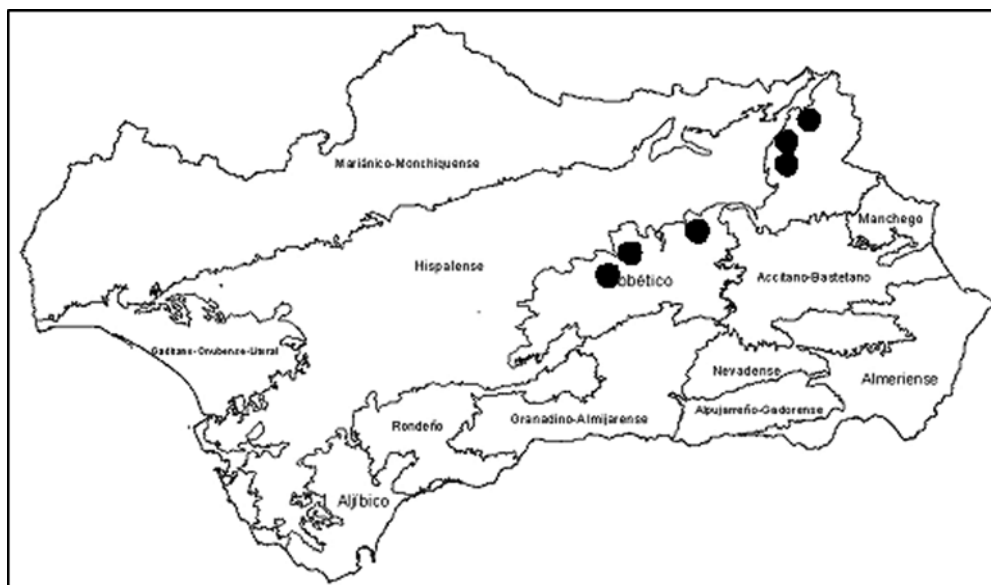


Figure 3. Biogeographical location of the *Berberido hispanicae*-*Buxetum sempervirentis* association.

Figure 3. Emplacement biogéographique de l'association *Berberido hispanicae*-*Buxetum sempervirentis*

Berberidetum hispanicae Mota nova. For that purpose, we take as the typus relevé number 3 of table 67 (rels. 1–3) by Mota Poveda (1990). Likewise, we support the subas. *prunetosum ramburii* Mota nova, with relevé 5 as its typus relevé (table 67, rels. 4–7) by Mota Poveda (1990). This subassociation represents a transitional form towards *Lonicero splendidae*-*Berberidetum hispanicae*. The package cluster relevés P₂ (127–137) all belong to *Lonicero splendidae*-*Berberidetum hispanicae*.

The statistical analysis revealed that the association *Cotoneastro granatensis*-*Prunetum ramburii*, described by Martínez-Parras and Molero Mesa (1983), is separated from the relevés belonging to *Lonicero splendidae*-*Berberidetum hispanicae*, as described by Asensi and Rivas-Martínez (1976). Relevés 10–11 of Table 2, provided by Martínez-Parras and Molero Mesa (1983), and the relevé made by these same authors between Puerto de la Ragua and Laroles (not included in that table) are characterized by the presence of *Adenocarpus decorticans*, *Genista baetica* and *Halimium viscosum* (whose edaphic optimum takes place in an acid pH) and the basophilous endemic plant *Prunus ramburii*. For this reason we prefer not to synonymize these thornland neutro-basophilous communities with the *Lonicero splendidae*-*Berberidetum hispanicae* association, described by its authors as being clearly calcicolous. However, the rest of the samples shown in Table 2 and taken on calcareous substrates should indeed be synonymized with *Lonicero splendidae*-*Berberidetum hispanicae*, as Rivas-Martínez et al. (2002) suggest, because there are no floristic differences between these two syntaxa. The thorny thicket vegetation of relevés 10 and 11 (see Table 2) and the sample taken in Puerto de la Ragua grow on slate outcrops whose richness in bases is the result of a capillarity-induced ascent as a result of a high potential evapotranspiration. From a dynamic point of view, this

thorny thicket represents a degraded state of the forests of *Adenocarpus decorticans*-*Quercetum pyrenaicae* Martínez-Parras and Molero 1983 subas. *aceretosum granatensis* Martínez-Parras and Molero 1983. For the Nevadensian Sector we propose the subas. *prunetosum ramburii* nova. As typus relevé we take relevé 10 of Table 2 by Martínez-Parras and Molero Mesa (1983), and we consider it to be subordinated to the *Lonicero arboreae*-*Rhamnetum cathartici* thorny thicket.

Conclusions

Two new associations, *Clematido vitalbae*-*Rosetum micrantha* and *Berberido hispanicae*-*Buxetum sempervirentis* are proposed here. The association described by Mota Poveda (1990), namely, *Roso siculae*-*Berberidetum hispanicae*, and the subas. *prunetosum ramburii* are validated, and for the neutro-basophilous areas of the Nevadensian Sector we propose the subas. *prunetosum ramburii* nova as being subordinated to *Lonicero arboreae*-*Rhamnetum cathartici*. With the information collected from 225 relevés from 22 phytosociological tables generated by different authors, we conduct a comparative and synthetic analysis (Table 2) and propose a new syntaxonomical scheme for the centre and south of the Iberian Peninsula.

Syntaxonomical scheme

Rhamno-Prunetea Rivas Goday and Borja ex Tüxen 1962

Prunetalia spinosae Tüxen 1952

Berberidion vulgaris Br.-Bl. 1950

Berberidenion seroi Rivas-Martínez, Loidi and Arnaiz 1986

- Ligustro vulgaris*-*Berberidetum seroi* Rivas-Martínez and G. López in G. López 1976 corr. Rivas-Martínez et al. 2002
- Amelanchiero-Buxenion (O. Bolòs and Romo in Romo 1989) I. Soriano and Sebastià 1990
- Berberido-Buxetum sempervirentis* Rivas-Martínez and G. López in G. López 1976
- Pruno-Rubion ulmifolii* O. Bolòs 1954
- Pruno-Rubenion ulmifolii*
- Rubetum caesio-canescens* Ríos and Alcaraz in Rivas-Martínez et al. 2002
- Rubo ulmifolii-Corietum myrtifoliae* O. Bolòs 1954
- nerietosum oleandri* Costa, Peris, Figuerola and Stübing 1985
- Rosenion carioti-pouzinii* Arnaiz ex Loidi 1989
- Clematido campaniflorae-Rubetum ulmifolii* Peinado and Velasco in Peinado, G. Moreno and A. Velasco 1983
- Lonicero hispanicae-Rubetum ulmifolii* Rivas-Martínez, Costa, Castroviejo and E. Valdés 1980
- Rosetum micrantho-agrestis* Rivas-Martínez and Arnaiz in Arnaiz 1979
- Rubo ulmifolii-Rosetum corymbiferae* Rivas-Martínez and Arnaiz in Arnaiz 1979
- Clematido vitalbae-Rosetum micranthae* ass. nova
- Lonicero-Berberidion hispanicae* O. Bolòs 1954
- Berberido hispanicae-Crataegetum laciniatae* Ríos and Alcaraz in Alcaraz, P. Sánchez, De la Torre, Ríos and J. Álvarez 1991
- Lonicero arborea-Rhamnetum catharticae* Martínez-Parras and Molero 1983
- prunetosum ranburii* subas nova
- Lonicero splendidae-Berberidetum hispanicae* Asensi and Rivas-Martínez 1979
- (syntax. syn. *Cotoneastro granatensis-Prunetum ramburii* Martínez-Parras and Molero 1983)
- Pruno mahalebo-Berberidetum hispanicae* Asensi and Rivas-Martínez 1979
- Rosetum myriacantho-siculae* Ríos, P. Sánchez and Alcaraz in Alcaraz, P. Sánchez, De la Torre, Ríos and J. Álvarez 1991
- Viburno lantanae-Berberidetum australis* F. Valle, Gómez-Mercado and Mota 1988
- rubetosum canescens* F. Valle, Gómez-Mercado and Mota 1988
- Lonicero splendidae-Buxetum sempervirentis* Gómez-Mercado and F. Valle 1992
- Berberido hispanicae-Buxetum sempervirentis* ass. nova
- Roso siculae-Berberidetum hispanicae* Mota ass. nova
- prunetosum ramburii* Mota subas. nova
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Appendix. Numbering of relevés in the cluster analysis and relations with the relevés in the tables used.

Annexe. Numérotation des inventaires dans le cluster et son rapport avec les inventaires des tables utilisées.

- 1 (rels. 1–35). *Rubo ulmifolii-Rosetum corymbiferae* Rivas-Martínez and Arnaiz in Arnaiz 1979 (Arnaiz 1979, Table 1 rels. 1–35)

- 2 (rel. 36–66). *Rosetum micraniho-agrestis* Rivas-Martínez and Arnaiz in Arnaiz 1979 (Arnaiz 1979, Table 2 rels. 36–66)
- 3 (rel. 67). *Berberido hispanicae-Crataegetum laciniatae* Ríos et Alcaraz in Alcaraz, P. Sánchez, De la Torre, Ríos and J. Álvarez 1991 (Alcaraz et al. 1991, typus rel. page 58)
- 4 (rels. 68–73). *Rubetum caesio-canescens* Rivas-Martínez Ríos and Alcaraz in Rivas-Martínez et al. 2002 (Rivas-Martínez et al. 2002, Table 84 rels. 1–7)
- 5 (rels. 74–80). *Rosa siculae-Berberidetum hispanicae* (Mota 1990, Table 67 rels. 1–3 subas. *berberidetosum hispanicae*, rels. 4–7 subas. *prunetosum ramburii*)
- 6 (rels. 81–86). *Clemati campaniflorae-Rubetum ulmifolii* Peinado and A. Velasco in Peinado, G. Moreno and A. Velasco 1983 (Peinado, Moreno and Velasco 1983, Table 3 rels. 1–6)
- 7 (rels. 87–89). *Lonicero arboreae-Rhamnetum catharticae* Martínez-Parras and Molero 1983 (Martínez-Parras and Molero Mesa 1983, Table 3 rels. 1–3)
- 8 (rels. 90–97). *Pruno mahalebo-Berberidetum hispanicae* Asensi and Rivas-Martínez 1979 (Asensi and Rivas-Martínez 1979, Table 4 rels. 1–8)
- 9 (rels. 98–106). *Lonicero splendidae-Berberidetum hispanicae* Asensi and Rivas-Martínez 1979 (Asensi and Rivas-Martínez 1979, Table 3 rels. 1–9)
- 10 (rels. 107–121). *Viburno Lantanae-Berberidetum australis* F. Valle, Gómez-Mercado and Mota 1988 (Valle, Gómez-Mercado and Mota 1988, Table 3 rels. 1–15)
- 11 (rels. 122–126). *Crataego monogynae-Loniceretum arboreae* O. Bolòs 1954 (Martínez-Parras and Molero Mesa 1983, Table 1 rels. 1–5)
- 12 (rels. 127–138). *Cotoneastro granatensis-Prunetum ramburii* Martínez-Parras and Molero 1983 (Martínez-Parras and Molero Mesa 1983, Table 2 rels. 1–12)
13. (rels. 139–147). *Lonicero splendidae-Buxetum sempervirentis* Gómez-Mercado and F. Valle 1992 (Gómez-Mercado and Valle 1992, Table 3 rels. 1–9)
- 14 (rels. 148–152). *Crataego monogynae-Loniceretum arboreae* O. Bolòs 1954 (Asensi and Rivas-Martínez 1979, Table 2 rels. 1–5)
- 15 (rels. 153–155). *Ligustro vulgaris-Berberidetum seroi* Rivas-Martínez and G. López in G. López 1976 corr. Rivas-Martínez et al. 2002 (G. López 1976, Table 15 rels. 1–3)
- 16 (rels. 156–166). *Rubus ulmifolii-Coriarietum myrtifoliae* O. Bolòs 1954 subas. *nerietosum oleandri* Costa, Peris, Figuerola and Stübing 1985 (Ríos Ruiz, Alcaraz and Valdés 2003, Table 55 rels. 1–11)
- 17 (rels. 167–176). *Rubus ulmifolii-Rosetum corymbiferae* Rivas-Martínez and Arnaiz in Arnaiz 1979 (Ríos Ruiz, Alcaraz and Valdés 2003, Table 57 rels. 1–10)
- 18 (rels. 177–190). *Rosetum micrantho-agrestis* Rivas-Martínez and Arnaiz in Arnaiz 1979 (Ríos Ruiz, Alcaraz and Valdés 2003, Table 56 rels. 1–14)
- 19 (rels. 191–200). *Crataego monogynae-Loniceretum arboreae* O. Bolòs, 1954 (Martínez-Parras, Peinado and Alcaraz 1987, Table 3 rels. 1–10)
- 20 (rels. 201–206). *Berberido-Buxetum sempervirentis* Rivas-Martínez and G. López in G. López 1976 (G. López 1976, Table 16 rels. 1–6)
- 21 (rels. 207–215). *Lonicero hispanicae-Rubetum ulmifolii* Rivas-Martínez, Costa, Castroviejo and E. Valdés 1980 (Rivas-Martínez et al. 1980, Table 62 rels. 1–9)
- 22 (rels. 216–225). *Berberido hispanicae-Buxetum sempervirentis* nova (Table 1 rels. 1–10)